

Table showing for the month of January, &c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
<i>Tennessee.</i>		<i>Inches.</i>			<i>Inches.</i>			<i>h. m.</i>	<i>Inches.</i>
Chattanooga.....	1882	14.74	1879	8-9	2.77				
Do.....			1879	11-12	3.32				
Do.....			1882	15-16	2.92				
Do.....			1886	2-3	3.04				
Do.....			1887	23-24	3.54				
Knoxville.....	1882	16.98	1875	28-29	2.82				
Do.....			1879	8-9	3.60				
Do.....			1879	11-12	3.30				
Do.....			1882	16-17	2.51				
Do.....			1882	20-21	2.74				
Do.....			1882	28	2.94				
Do.....			1883	20	3.50				
Memphis.....	1882	12.87	1872	15-16	3.50				
Do.....			1872	1-2	2.53				
Do.....			1875	27-28	3.96				
Do.....			1880	16-17	2.92				
Do.....			1882	16-17	3.06				
Do.....			1887	22-23	3.08				
Nashville.....	1882	14.51	1882	12-13	2.77				
<i>Texas.</i>									
Clarksville.....	1875	12.25	1874	22	2.50				
Do.....			1874	31	4.00				
Do.....			1875		6.50				
Galveston.....			1877	21	3.61	1879	31	1 05	1.47
Do.....			1883	5-6	3.48				
Do.....			1885	15-16	3.04				

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	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
<i>Utah.</i>		<i>Inches.</i>			<i>Inches.</i>			<i>h. m.</i>	<i>Inches.</i>
Coalville.....			1875	14-15	2.70				
Mount Carmel.....			1874	3	4.00				
Do.....			1874	15	4.00				
Do.....			1874	20	3.00				
<i>Virginia.</i>									
Lynchburg.....			1885	23	6.32				
<i>Washington.</i>									
Canby, Fort.....	1887	11.91							
Catalamet.....	1874	14.53							
Neah Bay.....	1874	30.50							
Do.....	1879	13.93							
Do.....	1884	15.50							
Do.....	1885	17.70							
Do.....	1886	16.40							
Do.....	1887	22.30							
Olympia.....	1880	10.69							
Pysht.....	1884	11.29							
Do.....	1885	14.31							
Do.....	1886	11.44							
Do.....	1887	13.76							
Tatoosh Island.....	1884	13.32	1884	10-11	4.06				
Do.....	1885	14.47	1884	11-12	4.00				
Do.....	1886	16.82	1885	5-6	3.43				
Do.....	1887	14.46	1885	6-7	3.40				
Do.....			1885	29-30	2.62				

WINDS.

The most frequent directions of the wind during January, 1888, are shown on chart ii, by arrows flying with the wind. In the upper Mississippi, Missouri, Ohio, and Saint Lawrence valleys, Lake region, and in the states bordering on the Atlantic, the most frequent directions were generally westerly or northwesterly; along the Gulf coast, northerly; on the Pacific coast and in the Rocky Mountain regions, variable.

HIGH WINDS (in miles per hour).

The maximum velocities of wind for January, 1888, at Signal Service stations where the movements are registered,

are given in the table of miscellaneous meteorological data. Other than the maximum velocities given in the table referred to, the following velocities of fifty, or more, miles per hour have been reported: Pike's Peak, Colo.,* 84, nw., 1st; 84, w., 2d; 80, w., 3d. Buffalo, N. Y., 50, w., 10-11th. Fort Totten, Dak., 50, s., 11th. Huron, Dak., 50, nw., 13th. Fort Canby, Wash., 52, s., 22d; 54, s., 26th; 68, s., 28th; 54, s., 29th. Tatoosh Island, Wash., 54, s., 25th; 53, se., 27th; 51, s., 28th. Wood's Holl, Mass., 50, w., 26th.

* At Pike's Peak, only, velocities exceeding seventy-five miles are given.

INLAND NAVIGATION.

ICE IN RIVERS AND HARBORS.

Frenchman's Bay.—Bar Harbor, Me.: there was much ice in the bay during latter part of month; navigation closed 28th.

Casco Bay.—Portland, Me.: the harbor was frozen over with thin ice from the 24th to the 28th, making navigation difficult. During the storm of the 26th the bay was completely filled with ice, rendering navigation impossible.

Boston Harbor.—Boston, Mass.: the harbor was almost entirely frozen over on the 23d.

Holmes Hole Harbor.—Vineyard Haven, Mass.: the harbor was frozen over from the 17th to the 23d.

Nantucket Harbor.—Nantucket, Mass.: the harbor froze over on the 21st, closing navigation.

Wood's Holl Harbor.—Wood's Holl, Mass.: the harbor was blockaded with ice and frozen solid to Nantucket Island on 21st. Buzzard Bay was also frozen for several hundred yards from the shore; all navigation was temporarily suspended on the above date.

Edgartown Harbor.—Edgartown, Mass.: the harbor froze over on the 24th and remained frozen to the end of month.

New Haven Bay.—New Haven, Conn.: the harbor froze over on the 17th.

Lake Champlain.—Burlington, Vt.: the lake froze over on the 22d, seven days earlier than the average date for the last seventy years.

East and North rivers.—New York City: floating ice in both

rivers on the 3d; East River was choked with ice on the 19th, 28-29th. There was an unusual amount of drift ice in the upper bay on the 23d.

Seneca Lake.—Starkey, Yates Co., N. Y.: on the morning of the 22d the lake was frozen over. It rarely occurs that this lake freezes over before February.

North Branch Susquehanna River.—Catawissa, Columbia Co., Pa.: river opened on the 2d and closed again on 20th.

Chesapeake Bay and Baltimore Harbor.—Baltimore, Md.: ice in bay and harbor rendered navigation difficult on 23d, 24th, and 25th; winds cleared the harbor of ice on the 26th.

Kitty Hawk Bay.—Kitty Hawk, N. C.: navigation closed 30th.

Alleghany and Monongahela rivers.—Pittsburg, Pa.: floating ice in both rivers on 1st, 3d to 8th, 22d to 24th, 27th to 29th, and in Alleghany River from 9th to 21st, 23d, 25th, 26th; on the 2d ice carried away a span of the 30th street bridge.

Ohio River.—Portsmouth, Scioto Co., Ohio, 31st: there was more or less floating ice in river during the entire month, and much of the time it was so heavy as to prevent navigation.

Louisville, Ky.: floating ice on 3d rendered navigation dangerous; navigation suspended from 21st to 25th, and 27th, 28th;

Cairo, Ill.: floating ice from 17th to 21st.

Mississippi River.—The Mississippi was frozen throughout the month at Keokuk, Iowa, and to the northward.

Saint Louis, Mo.: a rapid rise in river occurred on the 23d, caused by an ice dam at Carondelet, a few miles south.

Cairo, Ill.: floating ice on 1st, 2d, 8th, and 14th. An ice dam formed at Bird's Point, Mo., on the 15th and remained intact until the 31st, when it broke.

Missouri River.—The Missouri was frozen throughout the month at Leavenworth, Kans., and to the northward.

Arkansas River.—Little Rock, Ark.: floating ice 17th, 21st. Mackinaw Strait.—Mackinaw City, Mich.: the strait froze over on the 1st, on the 2d the ice was about two inches thick.

Saint Olair River.—Port Huron, Mich.: floating ice on 2d, 4th, 6th, 8th, 10th, 11th, 19th. Navigation closed on the 12th. An ice bridge formed on the 20th.

Sacramento River.—Sacramento, Cal.: floating ice on the 14th, the first observed since 1854.

Columbia River.—Portland, Oregon: river froze over on 9th, closing navigation; river was still frozen on 26th.

Willamette River.—Portland, Oregon: river froze over on 13th; people crossed on ice on 15th; ice broke up on 25th; navigation resumed on 26th.

FLOODS.

Los Angeles, Cal.: the heavy rains of the 3d and 4th caused numerous washouts on the railroads in this section, causing suspension of travel.

Boisé City, Idaho: an ice-dam formed in Cottonwood Creek on the 24th, causing an overflow in the eastern part of the city. Some of the farmers in the valley near here lost considerable hay and grain by the freshet on the 25th. On the 26th the Idaho Central Railroad was submerged at Ten-Mile Creek, between Boisé City and Nampa, and no trains passed over the road on that date.

Fort Assinaboine, Mont., 30th: during the recent warm weather the rivers in this section have overflowed and some railroad bridges have been carried away by the flood. No mail has arrived for four days.

Eureka, Humboldt Co., Cal., 31st: owing to the recent very heavy rains the streams in this section have risen to unusual heights, and in some localities considerable areas have been flooded; bridges were swept away, and numerous washouts occurred.

Hydesville, Humboldt Co. Cal.: the heavy rains of the 29th to the 21st caused the rivers in this county to reach the highest stages known during the last nine years.

STAGE OF WATER IN RIVERS AND HARBORS.

The Ohio at Pittsburg rose continuously from the 1st to 8th, and, having risen about eighteen feet, was within seven-tenths of a foot of the danger line on the last-named date. This rise permitted large fleets of coal barges to move down the river.

Nashville, Tenn., 2d: the heavy rains of December 31st and January 1st caused the Cumberland River to rise 14.5 feet in twenty-four hours, giving a depth sufficient for navigation on both the upper and lower Cumberland. Navigation has been closed on account of low water since June 19, 1887.

Louisville, Ky.: the river was very low on the 1st, but by the 9th it had risen sufficiently to permit the running of the larger steamers. The river reached its highest stage on the 15th, when it was about ten feet higher than on the 1st.

In the following table are shown the danger-points at the various stations, the highest and lowest depths for January, 1888, with the dates of occurrence and the monthly ranges:

Heights of rivers above low-water mark, January, 1888 (in feet and tenths).

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, La.	29.9	24, 25	20.4	8, 9	17.3	3.1
Arkansas River:						
Fort Smith, Ark.	22.0	31	6.5	2	1.3	5.2
Little Rock, Ark.	23.0	15	5.8	6, 7	2.6	3.2
Missouri River:						
Omaha, Nebr.	18.0					
Leavenworth, Kans.	20.0					
Mississippi River:						
Saint Paul, Minn.	14.5					
La Crosse, Wis.	24.0					
Dubuque, Iowa	16.0					
Keokuk, Iowa	14.0					
Saint Louis, Mo.	32.0	31	15.5	1	3.5	11.8
Cairo, Ill.	20	20	27.9	1	1.8	26.1
Memphis, Tenn.	34.0	22	22.0	3, 4	1.8	20.2
Vicksburg, Miss.	41.0	26, 27	26.3	7, 8	1.3	17.6
New Orleans, La.	13.0	31	8.6	3, 10, 11	1.7	6.9
Ohio River:						
Pittsburg, Pa.	22.0	8	21.3	31	2.3	19.0
Cincinnati, Ohio	50.0	13, 14	34.4	5	8.8	25.6
Louisville, Ky.	25.0	15	13.1	1	3.2	9.9
Cumberland River:						
Nashville, Tenn.	40.0	22	23.0	1	3.4	19.6
Tennessee River:						
Knoxville, Tenn.	18	18	12.6	30, 31	2.9	9.7
Chattanooga, Tenn.	33.0	19	25.7	31	5.6	20.1
Monongahela River:						
Pittsburg, Pa.	29.0	8	21.3	31	2.3	19.0
Savannah River:						
Augusta, Ga.	32.0	2	25.0	31	8.3	16.7
Sacramento River:						
Red Bluff, Cal.		31	17.6	15-19	0.8	16.8
Sacramento, Cal.		24	17.6	20	8.5	9.1
Willamette River:						
Portland, Oregon ..		31	16.5	9	0.0	16.5

* River frozen entire month. † Below bench-mark.

LOW TIDE.

Baltimore, Md., 28th.

ATMOSPHERIC ELECTRICITY.

AUORAS.

Moorhead, Minn.: an auroral arch was observed during the night of the 7-8th, being very brilliant at 6.30 a. m., at which time the arch had risen to an altitude of 22°; numerous streamers shot up to an altitude of 75°. The display began at 8 p. m. and ended at daylight.

Lyons, N. Y.: a fine aurora, with streamers, was observed from 8 to 10 p. m. on the 13th. During the morning of the 17th a diffuse aurora, with streamers at intervals, was visible from 3 to 4 a. m.

Saint Vincent, Minn.: an auroral arch was visible from 8 p. m. on the 7th until sunrise on the following day; before midnight the display consisted of a low, broad arch, with an altitude of 10°, and covered 100° of the horizon. At 7 a. m. the display was probably at its maximum, at which time huge flames of light rolled up to within 10° of the zenith.

Northfield, Vt.: a brilliant aurora was observed from 8.30 to 10.30 p. m. on the 13th. It consisted of streamers which seemed to radiate from the horizon; the central streamer was

located in the magnetic north and during the period of greatest brilliancy, from 9 to 9.15 p. m., it reached an altitude of 50°. The display covered about 50° of the horizon, and the color was like that of an electric light.

Auroras were also observed during the month as follows: 6th, Poplar River, Mont. 7th, Garden City, Webster, and Huron, Dak.; Northfield, Vt.; Saint Vincent, Minn.; Poplar River, Mont., and Nashua, N. H. 8th, Fort Totten and Bismarck, Dak.; Cornish and Orono, Me.; Saint Vincent and Duluth, Minn.; Fort Assinaboine, Mont.; Embarras, Green Bay, and La Crosse, Wis. 9th, Palermo, N. Y. 10th, Lansing, Mich., and Saint Vincent, Minn. 12th, Egg Harbor City, N. J.; Palermo, N. Y.; Eastport, Me. 13th, Mackinaw City and Marquette, Mich.; Saint Vincent, Minn.; Poplar River, Mont.; Friendship and Setauket, N. Y.; Spokane Falls, Wash. 14th, Fort Totten, Dak.; Saint Vincent, Minn.; Fort Assinaboine and Poplar River, Mont. 15th, Saint Vincent, Minn.; Embarras, Wis. 16th, Marquette, Mich.; Fort Assinaboine, Mont.; Egg Harbor City, N. J.; Lunenburg, Vt. 17th, Nashua, N. H.; Poplar River, Mont. 23d, Nashua, N. H.